Technical Assistance Closure Report Template

Objective of the technical assistance (TA) Closure Report:

- To communicate publicly in one document a summary of progress made and lessons learned during the TA towards the anticipated impact (sections 1-4).
- To document qualitative and quantitative data collected during TA, for use in donor and UN reporting (Annex 1).

Steps for completing the TA closure report:

1. The lead TA implementer submits the closure report at the end of the technical assistance as a final deliverable. The TA closure report will capture outputs, outcomes and impacts of all activities conducted under the TA. Please copy and summarise relevant material from previous TA outputs/deliverables and the Response Plan, as relevant.
2. A CTCN Manager will review and revise the closure report before final approval by the CTCN Deputy Director.

Important note on public and internal use of the closure report:
Once approved by the CTCN Deputy Director, the TA closure report will be a public document available on the CTCN website www.ctc-n.org. Selected content will be used for targeted communication activities. Annex 2 is for internal use only and will not be publicly available.

Closure Report for CTCN Technical Assistance

1. Basic information

Title of response plan	**Urban briquette making pilot project - Kenya**
Technical assistance reference number	**2019000035**
Country / countries	**Kenya**
NDE organisation	**Kenya Industrial Research and Development Institute (KIRDI)**
NDE focal point	**Dr Kelvin Khisa** **Principal Research Scientist and CTCN Focal Point Coordinator**
NDE contact information	**Kelvin.khisa@kirdi.go.ke /** **kelvinnamukhasi@gmail.com** **PO Box 30650 – 00100 Nairobi Kenya**
Proponent focal point and organisation	**Greening Kenya Initiative Trust**
Designer of the response plan	**Greening Kenya Initiative Trust** **Mr. Peter Odhengo** **National Coordinator** **odhengo@gmail.com**
Implementer(s) of technical assistance	**EED Advisory (www.eedadvisory.com)**
Beneficiaries	The TA assessed the whole landscape of briquette production providing recommendations on; (i) creating an enabling environment for briquette production in Kenya, (ii) suitable raw materials for briquette production, (iii) suitable briquette technologies, (ii) proposed scenarios

	for briquette production and, (iv) a briquette production manual. Data and information synthesised under this assignment will potentially benefit the various actors in the briquette sector as outlined below; - Existing briquette producers who would wish to improve and scale their briquette production processes both in Kenya and other countries - Aspiring briquette producers - The government of Kenya- the Bioenergy department under Ministry of Energy- which is keen on growing the briquette sector, the Ministry of Environment, KEFRI & KFS - Development organizations with briquette programs - Briquette associations e.g United Briquette Production Association to lobby for reforms in the briquette sector - Research institutions e.g. Kenya Institute of Research and Development (KIRDI)
Sector(s) addressed	Renewable Energy Waste Management Forestry
Technologies supported	- Biomass Briquettes (carbonized and non-carbonized) under the renewable energy sector and the bioenergy technology group. Carbonized briquettes are suitable for household use, space warming in hotels and poultry farming while non-carbonized are preferred for industrial use. - Municipal Solid Waste- part of the TA was to access the viability of solid waste as a raw material for briquette production. Utilization of the identified waste for briquette production will aid in achieving waste management - Sustainable Forest Management –briquettes are viewed as alternatives fuels to firewood in industries and charcoal in households and enterprises. Uptake of briquettes would potentially reduce deforestation and contribute towards sustainable forest management.
Implementation start date	01/10/2019
Implementation end date	31/12/2020
Total budget for implementation	$ 65,008
Description of delivered outputs and products as well as the activities undertaken to achieve them. In doing so, review the log frame of the original response plan and refer to it as appropriate	The objective of the technical assistance was to evaluate the briquette sector with a focus on charcoal dust, sawdust and organic municipal solid waste and their potential as viable feedstock options to produce briquettes. Additionally, this assignment assessed the briquetting value chain ranging from sourcing of raw materials, briquette production technologies, supply chains and the policy environment in the sector. For each of these tasks, the output was a standalone report. The

	implementation of the technical assistance was through three main activities described below; i. ***Literature and secondary data review*** included the appraisal of relevant literature on briquetting sector technologies (e.g. briquetting technologies, potential raw materials for briquette production etc.) from peer-reviewed journals, grey literature, Government reports and various data depositories. ii. ***Primary data collection*** involved conducting interviews with briquette producers, briquette making equipment fabricators and distributors, and a select set of opinion leaders and experts in the sector. iii. ***Report synthesis***, which focused on aggregating and analyzing qualitative and quantitative data to identify the briquette making technologies in Kenya and the challenges in the sector. This culminated in the development and refining (based on comments from CTCN) of six output reports as listed below; **Output 1- <u>Review of legal frameworks related to briquette production in Kenya</u>** - Assessment of policy framework for briquette production in Kenya - Review of the policy framework from a gender perspective - Policy related barriers, gaps and recommendations for the sector **Output 2: <u>Identification of biomass waste-based briquettes making technologies</u>** - Description of the briquette production process for both carbonized and non-carbonized. - Inventory of existing briquetting technologies (type, merit and demerit cost and expertise required) - Recommendations on how to promote uptake of technologies **Output 3.1- <u>A baseline report on the existing briquettes value chain</u>** - Quantifying the demand of charcoal and wood fuel in Kenya - Assessment of existing briquette value chains (up-stream, mid-stream and downstream activities) **Output 3.2 - <u>A report detailing possible scenarios for briquettes value chain</u>**

	- Discussion of the proposed briquette production scenarios for both carbonized and non-carbonized - A comparative analysis of the scenarios **Output 4 - <u>A briquette production manual</u>** - Description of the briquette production process with the most suitable technologies - A list of briquetting machines distributors/ importers and fabricators - Identification for suitable business models **Output 5 -<u>Inventory of raw materials that can be used for making biomass briquettes</u>** - Impacts of Municipal Solid Waste to the Environment in a BAU Scenario - Opportunities for Waste Management - Assessment of Raw Materials for Briquette Manufacturing (quantity, quality and cost) - Comparative Analysis of the selected raw materials An in-depth description of the methodology applied for each of the output is described under each of the report listed above.
Methodologies applied to produce outputs and products	- Structured interviews with briquette producers - Semi-structured interviews with key informant from the government, development organizations, briquette associations - Semi-structured interviews with fabricators/distributors of briquette production machine - Semi-structured interviews with potential suppliers of raw materials for briquette production - Secondary literature review
Reference to knowledge resources	***<u>Instruction:</u> Please indicate if any UNFCCC Technology Executive Committee (TEC) knowledge products (publications, briefs, tools etc.) were used in the implementation of the TA request, and which.*** ***Link to TEC knowledge database:*** ***https://unfccc.int/ttclear/tec/documents.html*** N/A
Deviations	The TA was implemented during the Covid-19 pandemic period. With close consultation with the client, outputs were re-ordered starting with outputs that relied heavily on desk review and virtual interviews to minimize physical meetings, which would increase the risk of spreading the virus. This ensured that the TA was implemented within the stipulated period and quality was not compromised.

Anticipated follow-up activities and next steps	***<u>Instruction</u>: Please describe planned follow-up activities after completion of technical assistance, including information on involved stakeholders and anticipated timelines.*** ***The following are some examples of next steps:*** • ***Submission of a draft law/policy developed by the CTCN to cabinet/parliament.*** • ***Follow-up and formal submission of funding proposal drafted with support from the CTCN.*** • ***Implementation of activities designed by the CTCN.*** • ***Dissemination of report drafted by the CTCN.*** • ***Use of new expertise acquired during training led by CTCN.*** The TA assess the briquette production landscape from suitable raw materials and briquetting technologies, supply chains and enabling environment. This culminated in the development of a briquette production manual and provided recommendations on how to increase production and uptake of briquettes in Kenya. The outputs developed for this study can be utilized by the proponent, partner organizations and beneficiaries as discussed below. **<u>Proponent and partner organizations</u>** - The review of legal frameworks related to briquette production in Kenya identifies policy related gaps and barriers in the sector. Additionally, recommendations are provided on how to address these challenges. The proponent in collaboration with partner organizations and key players in the energy sector can use these recommendations to lobby and push for reforms in the sector. - Output 3.2 focuses on proposed pathways for the growth of the sector. Three scenarios have been proposed; (i) the first scenario aims to explore the possibility of working with already existing producers who already have an established value chain and enabling them to grow their businesses by addressing the challenges in the sector; (ii) setting up a central briquette facility utilizing bagasse as the raw material and the target market being either households or industries e.g tea factories; and (iii) setting a central production facility for briquettes using an emerging raw material such as human waste with household as the target consumers. The merits and demerits of each scenario are extensively discussed under report 3.2. The proponent and the partner organization can review the options and choose the best

	pathway or a combination of the top 2 best scenarios that would contribute to the growth of the sector depending on the available resources. Additionally, the most suitable technologies (raw materials and briquetting machines) are extensively discussed under output 2, output 5 and a production manual explaining the process of briquette production step by step is available under output 4. These three outputs (manual, raw materials and suitable technologies) will be key in implementing the scenarios. **Beneficiaries** The ultimate beneficiaries of this TA are existing and aspiring briquette producers, briquette program implementers, the government and briquette associations. These groups of beneficiaries can use the information gathered in these reports to; - Identify the most suitable material for briquette production - Identify the most suitable briquette production technologies (machines) to apply for their businesses - Apply the best practice in briquette production by following the step by step guide on the process of briquette production provided under the manual - The reports on briquette production technologies and the manual, links the briquette producers to local machine fabricators/importers/distributors for briquetting machines. An online platform is provided and a guide for shipping the machines to Kenya. This information is useful in identifying points of purchase for the briquette machines and where to source technicians if the machines breakdown - A guide is provided on the identification of viable business models for existing briquette producers and start-ups - The government (department of bioenergy under Ministry of Energy) and the Ministry of Environment & Forestry can use the recommendations on policy gaps and barriers related to the briquette sector to formulate policies and regulations that spur growth in the briquette sector. - Researchers can use the outputs reports as reference points for further studies in Kenya and in other countries

2. Lessons learned

	Lessons learned	Recommendations
Lessons learned from the CTCN TA process	Reports shared on the CTCN online platform from other projects were useful as reference points for development of the reports and templates.	CTCN to continue making study reports and templates available for public access on the CTCN online platform
Lessons learned related to climate technology transfer	**Appropriate technologies** The first step to effective transfer of climate technologies is identification of appropriate technologies. There are two types of briquettes and they are suited for different end-users. Carbonized briquettes burn with minimal smoke, contain lower ash content and have high calorific value and are therefore ideal for household use or space warming in (poultry farming or hotels). Non-carbonized briquettes are cheaper (per unit mass) and burn longer (up to 6 hours) and therefore preferred by larger consumers of briquettes such as institutions (schools, prison etc.). In addition to matching the appropriate briquette type to the target group, the next step is identification of appropriate technologies for burning the briquettes. For instance, at the household level improved charcoal stoves are associated with effectively burning carbonized briquettes. Also, retrofitting of industrial boilers is necessary for efficient burning of non-carbonized briquettes. Briquetting machines proposed under this TA are universal and can be replicated in other countries The most suitable material for briquetting may vary from country to country. But the methodology for identifying the most suitable briquetting material can be adopted to other countries. The key steps considerations are (i) quantity; (ii) quality and (iii) cost. Strategic creation of awareness for new technologies is essential for growing demand of quality products **Quality, availability and affordability of briquettes**	**Market intelligence and awareness** Briquette producers should gather market information for their products before commencement of their businesses. Information on the market size, existing and competing alternatives, supply and distribution channels, willingness and ability to pay, current and projected demand are necessary to inform on appropriate business models to adopt. **Provision of fiscal incentives by the government to briquette producers.** The following are possible ways to enhance briquettes competitiveness: - Enhancing R&D on briquettes through establishments of briquettes research platform in research institutions such as KIRDI to produce quality briquettes appropriate for specific use. For example, for household use, heating poultry houses, institutional use etc. - As the market is still at nascent stage, removal of taxations such as VAT on products and introducing fiscal incentives will accelerate the sector development. E.g. removal of import duty on briquettes equipment and machineries. **Voluntary approach for standards and labels** Development of standards for production of carbonized briquettes is in progress. Upon finalization of this standards. This TA recommends capacity building for briquettes producers to ensure quality briquettes are being produced. Further to enhance accelerated growth of the sector, this TA should focus on a voluntary standard and labelling will need to be introduced to help

	Briquettes are promoted as an alternative fuel at the household level. There exist competing fuels that are readily available, affordable and of high quality (i.e. charcoal). Briquettes have to be equally competitive in terms of cost and quality for uptake at the household level. Availability should also be consistent. **Strategic awareness creation** The level of awareness on briquettes at the household level is still very low. Quality assurance and awareness creation have to work hand in hand for the increased uptake of briquettes. Quality products without consumer awareness will not result to the anticipated market transformation in the sector. This is also true for creation of awareness for products that are of low quality. Consequently, the two have to work together under the umbrella program as described under recommendations. **A high potential uptake of non-carbonized briquettes compared to carbonized briquettes** Relative to non-carbonized briquettes, carbonized briquettes have a higher calorific value, burn with minimal smoke, contain lower ash content, and are not susceptible to insects such as termites. For these reasons, they are preferred for cooking and space heating (e.g. poultry farming). Non-carbonized briquettes are cheaper (per unit mass) and burn longer (up to 6 hours) and therefore preferred by larger consumers of briquettes such as institutions (schools, prison etc). Comparing the production cost of the two types of briquettes, non-carbonized briquettes are relatively less costly to produce than carbonized briquettes. In regard to the market of the two types of briquettes non-carbonized briquettes have a ready market such as industries. Additionally, there exist incentives in the uptake of products	consumer differentiate different quality of briquettes in the market. This is bound to act as a motivation to the producers to innovate and improve on their quality since there is a clear differentiation of briquettes in the market. Based on lessons from successful implementation of voluntary program in the solar sector, particularly Pico solar products under Lighting Global program led by the World Bank Group, this TA proposes a briquette program housed at the Ministry of Energy and or Kenya Bureau of standards that is centered around; (i) Development of a minimum standard and test methods (ii) Testing and verification of the products (iii) Communication and marketing of the standard **Strategic consumer awareness creation** Awareness creation across the sector should happen at least at two levels: i) Consumer awareness: targeting end-users in regard to identifying quality briquettes and their benefits. Briquettes end-users can be broadly grouped into domestic (households), commercial-institutional (small/medium businesses, educational and health institutions) and industrial consumers (large thermal energy users including tea factories) ii) Enterprise awareness; targeting the on standards and regulations for manufacturers, distributors, and implementers of programs on existing standards and regulation. **Promotion of non-carbonized briquettes for large-scale consumers of firewood**

	that are sustainably produced e.g. tea factories are a potential market non-carbonised briquette. Additionally, large quantities of firewood are consumed by institutions (schools, prisons, thermal intensive companies etc) compared to households. For instance, in 2018, the tea factories alone consumed around 904,000 tons of firewood[1]. Although, roughly 10.3 Mton of fuelwood are consumed by households, it may not directly translate to felling of a tree as households may harvest the dry parts of the tree. It can therefore be concluded that, since the non-carbonized briquettes have a ready market, low production cost would provide a better alternative source of energy to large consumers of firewood hence more focus should be directed to this target group if greater impacts (co_2 mitigation and curbing of deforestation) are to be realized. **<u>Technologies for burning briquettes</u>** Carbonized briquettes for household use require improved charcoal stove to burn without smoke. Briquette promotion programs should therefore aim to educate the consumer on the appropriate technologies to use for burning briquettes. Additionally, since the improved charcoal stoves are costly compared to the traditional charcoal stove, considerations should be made on ways of making the stoves affordable especially since the target market is the low-income households. Industrial boilers may need to be retrofitted or new boilers installed to efficiently burn non-carbonized briquettes especially if there is formation of clinkers (incombustible residue) as in the case of bagasse briquettes.	Production of non-carbonized briquettes for industrial or institutional use is recommended as a pathway that would yield high results in terms of mitigation of greenhouse gases and deforestation. Thermal intensive factories have been keen on reducing the use of firewood by substituting it with briquettes. The fluctuating costs of furnace oil have led to these factories looking for alternative sources of thermal energy. Tea factories are among these end-users of solid biomass. Unlike carbonized briquettes, production of non-carbonized briquettes does not require carbonizing equipment, binders and mixers are not required. Since the briquettes are sold to large scale consumers of briquettes no packaging machines or associated packaging cost is required. Bagasse is recommended as the most suitable raw material for production of non-carbonized briquettes due to low cost of the raw material and availability in large quantities (1,100,837 tonnes of bagasse annually from top 5 mills in Kenya)[2]To further reduce the cost of production, the briquette production facility would be located in Kisumu as most of the mills are located in Western Kenya. This would reduce the cost of transporting the raw material to the production site.

[1] UNEP (2019). *Sustainability of sugarcane bagasse briquettes and charcoal value chains in Kenya*

[2] Agriculture and Food Authority. (2019). Year Book of Sugar Statistics 2019.Nairobi; Kenya

3. Illustration of the TA and photos

For communication purposes, please provide 2-4 Power Point slides, including illustrations or charts, describing barriers, opportunities, methodology, activities, outputs and achieved results. The illustrations must be copied into the TA Closure report but must also be delivered as power point files. Also, please provide at least five high-resolution pictures in jpg format, capturing technical assistance. The pictures should illustrate how the TA has impacted the lives of the beneficiaries in particular and the communities in general.

TA Process

1.Desk Review

- Review of CTCN templates
- Review of peer reviewed journals on briquette production
- Review of project documents on briquette programs
- Online searches for briquette making equipments
- Review of polices

2.Data Collection

- Semi-structured interviews with the briquette producers
- Semi-structured interviews with briquette machine fabricators, importers
- KIIs with key stakeholders e.g. program implementers (E4I, SNV,),Ministry of Energy (MoE)

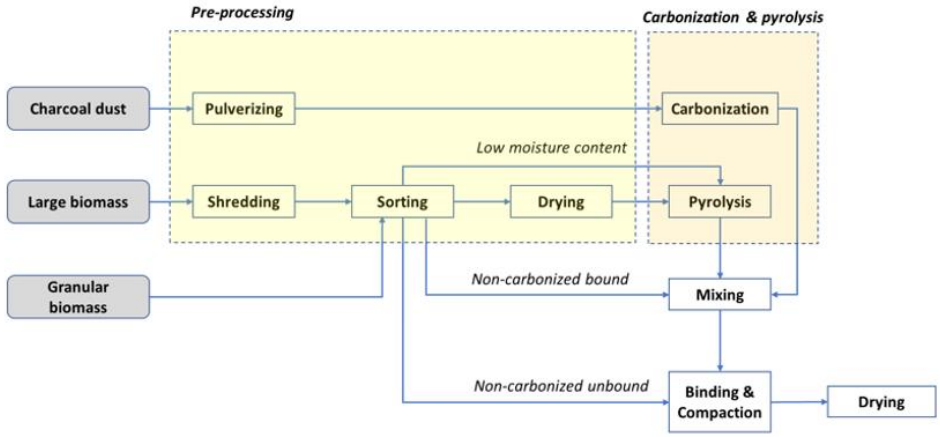
3. Synthesis and Reporting

- Analysis of qualitative and quantitative data
- Development of draft report
- Development of the final report incorporating comments from CTCN

TA Output Reports

#	Report	Title
1	Output 1	Review of legal frameworks related to briquette production in Kenya
2	Output 2	Identification of biomass waste-based briquettes making technologies
3	Output 3	Analysis of the supply chain of the briquette making processes
4	Output 4	Development of a training manual
5	Output 5	Inventory of raw materials that can be used for making biomass briquettes

Summary of the Briquette Production Process



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Briquetting Equipments Under Various Steps of Briauette Production

Sorting Machine

Hammer Mill

Electric Mixer

Shredding Machine

Drum Carbonizer Kiln

Carbonization Furnace

Images sourced from online platforms such as Hubpages and Alibaba.Com

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Drying of Raw Materials and Briquettes

Drier

Solar Drying- Greenhouse

Drying Racks in Open Field

Drying Racks in a Greenhouse

Images provided by Nawasscoal Limited and Acacia Innovations

Compacting Machines

Motorized screw press (fitted with a gear)- Kendubay Machinery

Motorized screw press – image provided by Kencoco Limited

Extruder Briquetting Press - C.F. Neilsen

Hydraulic Briquette Pressing Machine-C.F. Neilsen

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4. Impact Statement

The information in the table below will be used to communicate results and anticipated impacts of this technical assistance publicly. Please copy information from impact statement developed in the M&E Plan and update as relevant.

Challenge	*Approx. 500 characters with spaces* Wood fuel is the predominant cooking fuel in Kenya with 75% of households indicating its use. Demand for biomass in urban areas is deemed to increase due to rapid urbanization leading to unsustainable depletion of forests and carbon stocks. Additionally, the population pressure and limited resources has led to a waste management menace. Waste to energy is a feasible solution to alleviate the two problems. Kenya has requested technical assistance to promote briquette production from waste.
CTCN Assistance	*2 to 4 bullet points. Approximately 450 characters with spaces* - Identification of suitable raw-materials and technologies for briquette production resulting inthe development of an inventory for the most relevant strategic and environmentally sound technologies for production of briquettes - Development of a briquette production manual

	- Review of legal frameworks related to briquette production in Kenya - Analysis of the supply chain of the briquette making processes
Anticipated impact	*Summarize the problem statement and desired impact. Describe how the TA is expected to lead to the desired impact. Include description of stakeholders, deliverables and timelines. As a minimum, please include at least one of the core impact indicators from the closure report Annex.* Increased population in urban areas has led to an increase in energy demand. Conversion of waste to energy can address the increase in demand for energy and the need to effectively manage solid biomass waste from the growing urban populations. - Accelerate the development, deployment and diffusion of sustainable wood fuels systems to reduce reliance on unstainable wood fuel - Contribute towards the abatement of the emissions due to the use of fossil fuels in industries (19,898.2 tonnes of CO_2 annually) - Carbonized briquettes provide an alternative source of fuel that could potentially reduce the use and production of charcoal. With the enforcement of the charcoal regulations and production of quality, affordable carbonized briquettes it is anticipated that more households will transition towards the use of briquettes resulting to reduced charcoal production. - The stakeholders would include but not limited to; briquette producers, response plan proponent (Greening Kenya Initiative), NDE (KIRDI), Renewable Energy Directorate in the Ministry of Energy.
Co-benefits: Achieved or anticipated co-benefits from the TA	- Sustainable production and large-scale uptake of briquette will contribute to curbing deforestation and forest degradation and contribute to climate change mitigation by having more trees to absorb carbon.

	- Briquette production is viewed as one of the pathways that can be used for waste management resulting to cleaner environments and healthy societies. Utilization of this waste for briquette production will aid in addressing the health concerns and environmental issues associated with waste generation. - Development and growth of the briquette sector will also contribute to creation of jobs. Different job opportunities exist across the briquette production value chain including; raw material suppliers, brokers/intermediaries of both raw materials and briquettes, workers in the briquette production sites, distribution points and salesmen.
Gender aspects of the TA	The TA was aimed to benefit all genders (men andwomen). Both men and women can utilize the technologies discussed for briquette production. Although the findings of this study shows that, the proportion of women in briquette making is relatively high, besides the Bioenergy Strategy that has taken into consideration gender concerns, most energy policies do not explicitly address gender issues in access to energy for clean cooking. As indicated in the Bioenergy strategy, women have not in the past been actively involved in design of energy interventions hence limiting uptake of new technologies. They have also not been included in most public awareness and sensitization related to energy issues. In the context of clean cooking, this would limit their awareness on existing alternative fuels and cooking technologies and eventually the choice of the same. Deliberate effort in ensuring the key agents of change (e.g women) are integrated into the briquette production value chain will contribute to uptake of briquette in households as an alternative fuel. Implementation of this recommendation will contribute to consideration of gender issues in the formulation of energy policies especially on the clean cooking sector which is seen as one of the ways to increase uptake of briquettes at the household level.

Anticipated contribution to NDC	- TA will contribute towards the target of GHGs emissions cut by 30% by 2030 relative to the BAU scenario - Encourage the use of clean energy technologies to reduce overreliance on wood fuels - Sustainable waste management systems - Contribute towards achieving a tree cover of at least 10% of the land area of Kenya
The narrative story	Kenya requested support from the Climate Technology Centre and Network (CTCN) to develop and design an effective system to promote briquette production and usage. A review of the cooking fuels within the country indicates that 70% of the population uses wood as a primary or secondary source of cooking fuel with a prevalence of 26% for urban households. Due to the phenomenon of stacking, the use of charcoal is prevalent in urban households at 47%. Projections for wood fuel demand supply in 2020 indicate a deficit between demand and sustainable supply of 33,856,589 tonnes/yr. The high demand for wood fuel has led to illegal logging and deforestation. Moreover, 10% of the daily charcoal produced forms charcoal dust which is discarded. Additionally, effective solid waste management has been on the decline due to lack of capacity to expand the services at a pace matching the population growth rate. This has resulted in the collection of less than 40% of the total waste produced. The availability of biomass waste in urban areas coupled with a need for sustainable energy presents a business opportunity of converting waste to energy through the production of briquettes.
Contribution to SDGs A complete list of SDGs and their targets is available here: https://sustainabledevelopment.un.org/partnership/register/	SDG 7 – By 2030, ensure universal access to affordable, reliable and modern energy services. Through the Technical Assistance demand for charcoal briquettes will substitute the need for charcoal and other wood fuels as cooking energy. SDG 13 – Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries – By introducing renewable energy from waste briquettes, the TA will contribute to Kenya NDC strategies on climate mitigation

	through reduced deforestation and waste management. SDG 15 – Briquette production from biomass/agricultural waste will reduce demand for charcoal produced through cutting trees thus enhancing sustainable management of forests

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Annex 1 Technical assistance data collection

Please add quantitative and qualitative values for the indicators selected in the M&E plan and monitored throughout the technical assistance in the tables below. Indicators which have been monitored in addition to the proposed indicators below may be added at the end of table A. Non-relevant indicators should be left blank.

A. Output and outcome indicators

Indicator Please note indicators below highlighted as **anticipated**	**Quantitative value** *Numerals only; disaggregates must sum to the total*	**Qualitative description** *List the various elements corresponding to the quantitative value as well as timelines and responsible institutions*
Total number of events organized by proponents and implementing partners	*List total number here*	
Number of participants in events organized by proponents and implementing partners		
a) Number of men	*List total number here*	*Disaggregate by country*
b) Number of women		
Number of climate technology RD&D related events		
Number of participants in climate technology RD&D events	*List total number here*	
a) Number of men		
b) Number of women		
Number of training organized by proponents and implementing partners		*List the title of the training sessions and capacity strengthening activities*
Number of participants in trainings organized by proponents and implementing partners		
a) Number of men		
b) Number of women		
Total number of institutions trained		
a) Governmental (national or subnational)		*List the name of organisations trained here*
b) Private sector (bank, corporation, etc.)		*List the name of organisations trained here*
c) Nongovernmental (NGO, University, etc.)		*List the name of organisations trained here*
Percentage of participants reporting satisfaction with CTCN training (from CTCN training feedback form)		*Satisfied= 4+ on 5-pt scale*
Percentage of participants reporting increased knowledge, capacity and/or understanding as a result of CTCN training (from CTCN training feedback form)		*Increased knowledge, capacity and/or understanding= 4+ on 5-pt scale*
a) Percentage of men		
b) Percentage of women		

Total number of deliverables produced during the assistance (excluding mission, progress and internal reports)	*List total number here*	
a) Number of communication materials, including news releases, newsletters, articles, presentations, social media postings, etc.		*List the name of the documents*
b) Number of tools and technical documents strengthened, revised or developed		*List the name of the documents*
c) Number of other information materials strengthened, revised or created (For example training and workshop reports, Power Points, exercise docs etc.)		*List the name of the documents*
Total number of policies, strategies, plans, laws, agreements or regulations supported by the assistance	N/A	
a) Adaptation related		*List the type and name of documents supported*
b) Mitigation related		*List the type and name of documents supported*
c) Both adaptation- and mitigation related		*List the type and name of documents supported*
Anticipated number of policies, strategies, plans, laws, agreements or regulations proposed, adopted or implemented as a result of the TA		
a) Adaptation related		*List the type of documents anticipated to be proposed, adopted or implemented*
b) Mitigation related		*List the type of documents anticipated to be proposed, adopted or implemented*
c) Both adaptation- and mitigation related		*List the type of documents anticipated to be proposed, adopted or implemented*
Anticipated number of technologies transferred or deployed as a result of CTCN support	3	*Instruction: List the type of technologies supported by this assistance. Technologies must be identified from the CTCN taxonomy of climate sectors and technologies (download in pdf format and choose from column C): https://www.ctc-n.org/resources/ctcn-taxonomy* - Biomass Briquettes of Pellets - Municipal Solid Waste - Forest Management Techniques for Mitigation
Anticipated number of collaborations facilitated or enabled as a result of technical assistance	*List total number here*	
a) Number of South-South collaborations		*List the names of the organisations (excluding the CTCN or TA implementers)*

b) Number of RD&D collaborations		*List the names of the organisations (excluding the CTCN or TA implementers)*
c) Number of private sector collaborations		*List the names of the organisations (excluding the CTCN or TA implementers)*
Number of countries with strengthened National System of Innovation as a result of CTCN support		*List names of countries*
Insert any additional indicators here		

B. Core impact indicators

Please fill in the tables for anticipated impacts of the CTCN assistance. Every technical assistance should contribute to at least one of the indicators below. For guidance on how to report on core indicators see the 'M&E Guidance Document for TA Implementers'.

Core indicator 1	**Anticipated metric tons of CO_2 equivalent (CO_2e) emissions reduced or avoided as a result of CTCN TA** *Please add your calculations in word or excel format as an Annex to this Closure Report, where applicable.*	
	Anticipated metric tons of CO_2e reduced or avoided as a result of the TA **on annual basis**	Anticipated metric tons of CO_2e reduced or avoided as a result of the TA **in total**
Quantitative value *(emissions reductions)*	*Total number (numerals only, no rounding or abbreviations)*	*Total number (numerals only, no rounding or abbreviations)*
Unit	tCO_2e	tCO_2e
GHG assessment boundary (project emissions) Identify expected post-TA activities, associated effects and assess boundary for quantification of GHG emission reductions	19,898.2 tCO2 tonnes of CO_2	109,950.12 tonnes of CO_2
Baseline emissions Describe baseline scenario, baseline candidates, emission factors and emissions calculated	Production of 20,000 tonnes (annually) of non-carbonized briquettes for industrial use to replace furnace oil. Energy output from burning the bagasse= Calorific value of bagasse 13 GJ/tonne *20,000 tonnes of bagasse = 260,000 GJ Fuel oil has a calorific value of 42.18 GJ/tonne[3]. Therefore, approximately 6,200	With the assumption that the scenarios discussed under output 3.2, the programmes were assigned a timeline of 5 years and industries grow at 5 % growth rate (Kenya Economic Growth Outlook, 2020).Total emissions for the 5 years

[3] Europa EU. (2016). Sustainable Energy Handbook, Module 1.1: What is Energy? Retrieved from https://europa.eu/capacity4dev/file/29608/download?token=NPQ1CgGB

<table>
<tr>
<td></td>
<td>tonnes of fuel oil respectively are required to produce the same calorific value as 20,000 tonnes of bagasse.

$Total\ Emissions\ from\ activity(kgCO_2e) = Activity\ data\ (tonnes) \times Emission\ factor$ (kgCo$_2^e$/tonne)

Emission from burning the fuel oil = 6,200 tonnes * 3,209.38[4] (kgCO2)/tonne) = 19,898,156 kgCO2 or 19,898.2 tCO2

Baseline emissions 19,898.2 tCO2</td>
<td>is calculated by the summation of emissions in each year.
Baseline emission=19.898.2
Emission for each of the subsequent years= Baseline emission (total emission from previous year)* (i+ 1)^n
Where: i = growth rate
n= time
<table>
<tr><th>Year</th><th>Emission</th></tr>
<tr><td>1</td><td>19898.2</td></tr>
<tr><td>2</td><td>20,893.11</td></tr>
<tr><td>3</td><td>21937.77</td></tr>
<tr><td>4</td><td>23034.65</td></tr>
<tr><td>5</td><td>24186.39</td></tr>
<tr><td>Total</td><td>109,950.12</td></tr>
</table>
</td>
</tr>
<tr>
<td>Methodology

Explain the method or process of verifying the indicator and how data was gathered</td>
<td>- Fuel oil has a calorific value of 42.18 GJ/tonne[5].
- Calorific value of bagasse 13 GJ/tonne[6]
- Emission factor for fuel oil 3,209.38[7] (kgCO2)/tonne)
- Timeline 1 year

Methodology

$Total\ Emissions\ from\ activity(kgCO_2e) = Activity\ data\ (tonnes) \times Emission\ factor$ (kgCo$_2^e$/tonne)

Emission from burning the fuel oil = 6,200 tonnes * 3,209.38 (kgCO2)/tonne) = 19,898,156 kgCO2 or 19,898.2 tCO2

Baseline emissions 19,898.2 tCO2</td>
<td>It is assumed that the bagasse is sustainably grown and therefore carbon neutral. The total emission to be mitigated is therefore is the total amount of emissions that could have been emitted from the burning of fossil fuels.

Methodology

Baseline emission=19.898.2
Emission for each of the subsequent years= Baseline emission (total emission from previous year)* (i+ 1)^n
Where: i = growth rate
n= time
<table>
<tr><th>Year</th><th>CO_2 Mitigated</th></tr>
<tr><td>1</td><td>19898.2</td></tr>
<tr><td>2</td><td>20,893.11</td></tr>
<tr><td>3</td><td>21937.77</td></tr>
<tr><td>4</td><td>23034.65</td></tr>
<tr><td>5</td><td>24186.39</td></tr>
<tr><td>Total</td><td>109,950.12</td></tr>
</table>
</td>
</tr>
<tr>
<td>Assumptions
Describe assumptions made during calculation</td>
<td>- The target industries are using fossil fuel for their thermal energy requirements
- That Industries would be willing to switch from fossil fuel to briquettes</td>
<td>- More industries start to use briquettes
- Annual demand grow by about 5% , that means the briquettes</td>
</tr>
</table>

[4] The UK department of Environment, Food and Rural Affairs develops a database of national emission factors

[5] Europa EU. (2016). Sustainable Energy Handbook, Module 1.1: What is Energy? Retrieved from https://europa.eu/capacity4dev/file/29608/download?token=NPQ1CgGB

[6] Europa EU. (2016). Sustainable Energy Handbook, Module 1.1: What is Energy? Retrieved from https://europa.eu/capacity4dev/file/29608/download?token=NPQ1CgGB

[7] The UK department of Environment, Food and Rural Affairs develops a database of national emission factors

and quantification of GHG reductions	- Bagasse is sustainably grown and therefore carbon neutral compared to fossil fuels which introduced carbon that was stored.	industry will also be growing with demand - The sector is also maturing where more briquette producers are entering the market.

Core indicator 2	**Anticipated increased economic, health, well-being, infrastructure and built environment, and ecosystems resilience to climate change impacts as a result of technical assistance** *Please provide a **qualitative** description of the anticipated impacts on the categories below*
Infrastructure and built environment Anticipated increased infrastructure resilience (avoided/mitigated climate induced damages and strengthened physical assets)	
Ecosystems and biodiversity Anticipated increased ecosystem resilience (areas with increased resistance to climate-induced disturbances and with improved recovery rates)	
Economic Anticipated increased economic resilience (e.g. less reliance on vulnerable economic sectors or diversification of livelihood)	- Development and growth of the briquette sector will contribute to creation of jobs. Different job opportunities exists across the briquette production value chain including; raw material suppliers, brokers of both raw materials and briquettes, workers in the briquette production sites, distribution points and sales representatives. This is viewed as an opportunity to grow the household income contributing to better lives.
Health and wellbeing Anticipated increased health and wellbeing of target group (e.g. improved basic health, water and food security)	- Open dumpsites form breeding grounds for disease causing pests and parasites such as rats that pose a significant risk to public health. Utilization of waste for briquette production will aid in addressing the health concerns and environmental issues associated with waste generation. - Transitioning from use of polluting fuels such as firewood to quality briquettes will reduce household air pollution resulting to reduced instances of respiratory illnesses at the household level

Core indicator 3	Anticipated number of direct and indirect beneficiaries as a result of the TA	
	Quantitative value	**Means of verification**
Total beneficiaries	*Total number*	
Number of adaptation beneficiaries		*Describe calculation methods and assumptions made*
Number of mitigation beneficiaries	- At least 20 briquette producers - At least 6 fabricators and distributors of briquetting equipments - At least 5 government agencies and development agencies funding briquette programs	*Describe calculation methods and assumptions made* - The numbers were calculated from the interviews we conducted during the implementation of the TA - The numbers may increase or decrease depending on if more actors join or exit the briquette market - Direct beneficiaries of the outputs of the TA were considered
Number of adaptation-and mitigation beneficiaries		*Describe calculation methods and assumptions made*

Core indicator 4	Anticipated amount of funding/investment leveraged (USD) as a result of TA (disaggregated by public, private, national, and international sources, as well as between anticipated/confirmed funding)			
	Quantitative value confirmed *in USD*	**Quantitative value anticipated** *in USD*	**Qualitative description** *List the institutions, timelines, and description or title of the investment*	**Methods** *Describe methods used for quantification of funds leveraged*
Total funding	*Total number in USD (numerals only, no rounding or abbreviations)*	*Total number in USD (numerals only, no rounding or abbreviations)* **Scenario 1:** 2,346,160 **Scenario 2:** 3,859,020 (carbonized briquettes) 1,380,720 (non-carbonized briquettes)	**The first scenario** aims to explore the possibility of working with already existing producers who already have an established value chain. The program will be housed at the Renewable Energy Directorate in the Ministry of Energy	- Semi-structured Interviews with briquette producers and briquetting machines fabricators

		Note: Details provided in output 3.2	working with the Greening Kenya Initiative and other stakeholders in the sector. The program would run for 5 years. **Scenario 2** explores how an ideal value chain would look like by setting up a central production facility for briquettes one case for carbonized briquettes and another for non-carbonized briquettes. The Greening Kenya Initiative working together with an established briquette manufacturer to set up the production facilities.	and distributors - Online searches - KIIs with sector experts
Anticipated amount of public funding mobilised from national/domestic sources	**N/A**			
Anticipated amount of public funding mobilised from international/ regional sources	**N/A**			
Anticipated amount of private funding mobilised from national/domestic sources	**N/A**			
Anticipated amount of private funds mobilised from international/regional sources	**N/A**			

Annex 2 (for internal use – to be filled in by the CTCN)

CTCN evaluation

This section will be completed by the relevant CTCN Technology Manager.

- Evaluation of the timeliness of the TA implementation as measured against the timeline included in the response plan;
- Evaluation of TA quality as defined in the response plan;
- Overall performance of the Implementers;
- Overall engagement of the NDE and Proponent;
- Lessons learned on the CTCN process and steps taken by the CTCN to improve.